

Scaphoid Fracture Non Union Treated by Bone Graft and Plaster of Paris Cast Splint.

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Abstract

Objective: to evaluate the results of (Modification of Russe method) in treatment of nonunion fracture scaphoid bone by bone graft with external splintage (plaster of paris cast (pop)).

Methods: Prospective study done on 26 patients (24 male, 2 female), age range between 25-42 years (mean age 34 years), fracture site at middle 1/3 with minimal displacements with no carpal bone or radial bone injury, technique of Matte- Russe method (explore the bone through volar approach using bone graft from iliac crest (cortico-cancellous peg plus cancellous bone) with thumb spica for 90 days with period of follow up 12-18 months.

Results: out of 26 patients treated by this method, 23 patients (88.5%) union was achieved radiologically by the end of 3rd month & progressed over the next 3 months, range of motion of the wrist & power of grip

increased gradually became almost comparable to the normal side by the end of sixth month, 5-7 degrees loss of dorsiflexion was residual in 6 patients. Three patients (11.5%) did not show union radiologically after sixth postoperative month, their local symptoms were better than before surgery, they were not keen to have another operation. No complications were noticed, wound healed well, patient tolerance was good.

Conclusion: the use of cancellous bone graft with plaster of paris (p.o.p.) splint is less demanding surgically & less costly and resulted in good results (88.5% healed well). We recommend this treatment as a method for treating nonunion of carpal scaphoid bone.

Key words: nonunion, scaphoid, bone graft, plaster of paris.

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Introduction

Fracture of the carpal scaphoid is the most common fracture of the carpal bones and frequently diagnosis is delayed or missed and this alters the prognosis of union.

⁽¹⁾The blood supply of this bone is precarious and 35% of fractures of the proximal third may cause avascular necrosis and nonunion. ⁽¹⁾

Nonunion of the scaphoid usually causes dysfunction of the wrist and hand in the early weeks and probably inevitable wrist joint arthritis in coming years depending on the amount of stress applied to the wrist. ⁽²⁾

Treatment is necessary for healing of the fractures to regain function early. There are many modalities of treatment of nonunion and its sequel depending on the stage of the disease and the life style of the patient. ⁽³⁾ Bone graft is the constructive operation first described by Matte and modified by Russe; ⁽⁴⁾ to lead the fracture to unite and arrest the process of degeneration and improve the condition of the hand and wrist. ⁽⁵⁾ Internal fixation of the bone is added by many surgeons as the use of Kirschner wires ⁽⁶⁾, or screws like Herbert screw ⁽⁷⁾, or cannulated compression screw ⁽⁶⁾, or compression staples ⁽⁶⁾, prolonged periods of cast immobilization also needed to guarantee bone union, psychiatric background of the patient were also found to affect the result of treatment of nonunion ⁽⁸⁾. More complex procedures were used on cases of severe

avascular necrosis or cases reluctant to heal by mentioned above methods; Pronator Quadratus pedicle bone graft for old fractures ⁽⁹⁾, Scaphoid allograft also used to compensate for the excised necrotic proximal part of the scaphoid with promising success ⁽¹⁰⁾. The Matt- Russe technique by bone graft with plaster of paris (p.o.p.) cast immobilization is used to treat nonunion of the scaphoid bone ^(1,4,5,11,12,15,16).

Methods

This is a prospective study from May 2007- February 2011 of 26 patients with established symptomatic and radiological signs of nonunion of the carpal scaphoid, 24 males and 2 female, their age range was 25 -42 years, mean age was 34 years, more than two third of the patients, fracture site was at the middle 1/3 of the bone, the fracture was not displaced in 23 patients, one patient had mild volar displacement and two patients had radiological sign of increased density of the proximal pole assumed as avascular necrosis, no arthritic changes were evident in any of the wrist joints, period between initial trauma and treatment was 6-12 months, mean 9 months most of the cases were not diagnosed before and treated by insufficient period of cast immobilization or bandage for week or two as wrist sprain. Grossly displaced fractures and small proximal fragment fractures were excluded from the study. The volar approach used and technique of Matt-Russe ⁽¹⁾ was followed. The graft used was as solid piece

of cancellous bone plus filling with small pieces of graft from the iliac crest, then wound closed by two layers and below elbow thumb spica of plaster of paris applied for 90 days. The wound inspected through a window in the splint and stitches removed after 2 weeks. No drain used, AP- X-ray done postoperatively. The graft usually did not show in the early days but the extent of excavation and position of the scaphoid is noted postoperatively. P.O.P is changed after 2 months and removed by the end of the third month when X-ray is done to

follow the progress of healing and union of the bone, elastic bandage is applied to the wrist and gradual use of the hand was encouraged for further 2 months after which union was checked radiologically and all activities were allowed .Most patients were followed for a period of one year as mean time , few of them for 18 months ,in the three patients who did not show progressive healing, the P.o.P spica was extended for further 2 months, clinically they felt better and refused to have further treatment .

Patient	dominant Hand		Type of initial Treatment			causes of Injury		
	Right Hand	Left Hand	cast	Crepe bandage	Not remember	Fall	sports	Unknown
No.	21	5	15	6	5	16	7	3
%	80.76	19.23	57.7	23.1	19.2	61.5	26.9	11.6

Table 1: The relation between the patients and dominant hand, the type of treatment before surgery and cause of injury.

Patient	Stability of Fracture		location of Fracture			fracture Line		
	Stable Undisplaced	Unstable displaced	Distal 1/3	Middle 1/3	Proximal 1/3	Horizontal	transverse	Spiral
No.	20	6	2	18	6	14	8	4
%	76.9	23.1	7.7	69.2	23.1	53.8	30.8	15.4

Table2: the relation between the patients and the stability of the fracture, Location of fracture and Fracture line

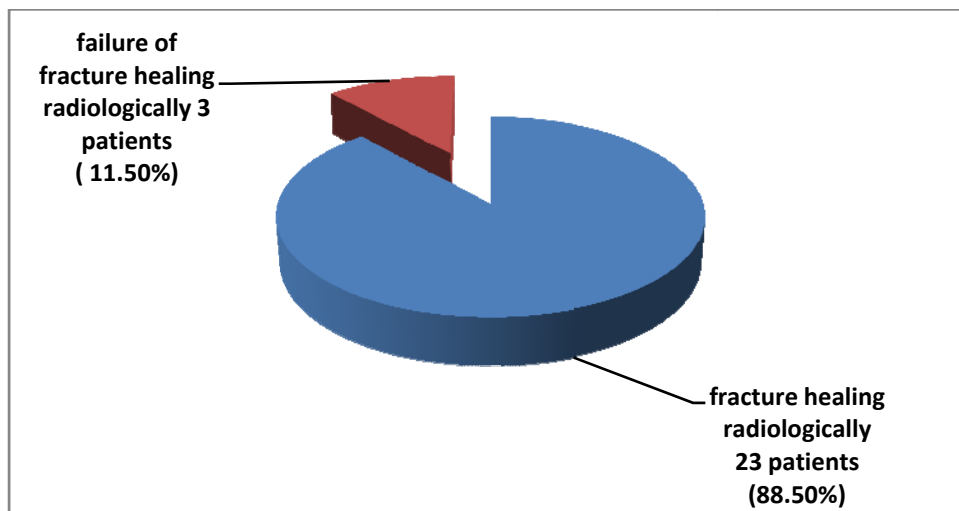


Figure 1 : Fracture healing radiologically

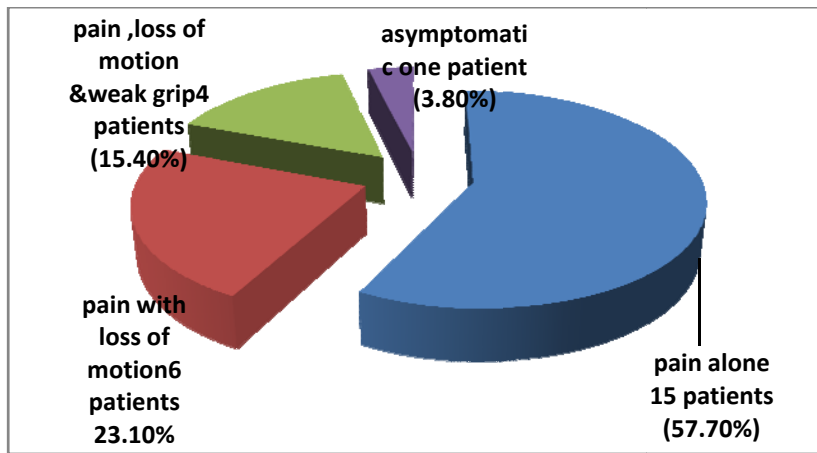


Figure 2: The relation between the patients and the complaint

Grip strength in mm Hg	No. of patients	%
90	2	7.7
100	2	7.7
110	1	3.8
130	12	46.2
130	4	15.4
140	5	19.2
Total	26	100

Table3: Grip strength

Type of Motion	Normal Range	Mean Reduce in nonunion	Deficit	%
Volar flexion	60-70	10-20	20	76.9
Dorsal flexion	50-65	10-20	6	23.1
Total			26	100

Table 4: Loss of Motion

Results:

Total number of patients was 26; period of follow up was 12 months as mean time range between 6-18 months. Union was evident radiologically by the end of the third month and progressed on over the next three months in 23 patients (88.5%) of the total number

- Radio scaphoid arthrosis despite fracture union was presented in 4 patients (15.4 %), 3 patients (11.6%) has a mild degree and 1(3.8 %) had moderate degree of arthrosis.
- 16 patients (61.5 %) were totally free of pain both at rest and exercise, 7 patients (26.9%) stated slight to moderate pain and 3 patients (11.5 %) noted pain at rest and sever pain at exercise.

4. Grip strength was increased by an average of (30%) the average strength about 160 mmHg. So out of 26 patients, 21 patients (80.8 %) their grip strength increase by 30% or more, the other 5 patients (19.2%) were only slight or no improvement of grip.

5. Wrist motion dorsi-flexion was unchanged while the volar-flexion improved by about 10%, ulnar deviation not affected while

radial deviation reduced by 20%, pronation and supination were unaffected

6. Three patients (11.5 %) did not show complete union radiologically after 6th postoperative month, their local symptoms and signs were better than before surgery but they were not keen to have another operation of bone graft. All surgical wounds healed uneventfully, no infection encountered



Pre-operative



2 months post operative



6 months post operative

Discussion:

Nonunion of the scaphoid studied for many years and most authors agreed that bone graft with stabilization of the bone is the proper treatment, with progress in technology several devices have been manufactured and used namely Herbert screws⁽¹¹⁾, Ao(ASIF) cannulated screw⁽⁶⁾, compression staple⁽⁶⁾, K.wire⁽⁶⁾ and vascularized bone graft⁽⁸⁾ for difficult cases, these methods gave good results, however were demanding surgically and needed other operation to remove the device and frequently needed pre-operation use of X-ray.

The use of these devices did not decrease the period of cast wearing^(3,6,7) and did not show significant decrease in the time of healing⁽¹³⁾, J.D Mulder and Annaklinek from the Netherlands (1988) had 97% good result in 100 patients treated by Matt-Russe bone graft without fixation device⁽³⁾, Lawrence H. Schnerider gained 87% union of scaphoid using Russe procedure (1982)⁽¹⁴⁾. Diego L Fernandez MD, Aarau

from Switzerland (1990) had 95% union with the use of cortical lag screw technique to fix the bone with bone graft + short cast immobilization⁽⁸⁾. Most operations of implant fixation need variable time of preoperative X-ray screen. We use the original Matt-Russe technique by applying hard cancellous bone graft from iliac crest to impact the prepared fracture site and external P.O.P splint and we gained equally good results compared to the studies used fixators to the bone, we admit that we selected our patients of stable minimally displaced fractures and with large proximal piece and without degenerative changes. Our follow up was not prolonged (for 12 months) because of nature of doctor patient relationship in our community as the patient do not visit the clinics for academic reason and tend to disappear when satisfied with their conditions.

Conclusion:

From our study we find the following points to be mentioned here:

1. Some type of fractures are prone to nonunion e.g. proximal pole and small fragment fracture.
2. Proper early management of fracture scaphoid will decrease the percentage of nonunion.
3. Early surgical interference for established nonunion got high chance of union rate while delayed surgery will have less chance.
4. Volar approach is preferable than other approaches because of its advantages.
5. Success rate for union will increase if there is no associated complication with the nonunion as arthrosis or avascular necrosis.
6. A symptomatic nonunion is not a contraindication for surgery but it may be regarded as a relative indication those a symptomatic cases pass into arthritic changes on long time follow up and the complain will be changed accordingly.
7. Improvement in range of movement is not so dramatic while the improvement in the function is very good by relieving the pain and making the movement painless.
8. No internal fixation have been used in our study so operation was made relatively easier
- 9 The use of cancellous bone graft with P.O.P splint is less demanding surgically and less costly and resulted in good result (88.5%) in most of our patients. We recommend this method as a treatment for nonunion of scaphoid bone, we consider this study as a practical application for the modification of Russ-Matt method in treating nonunion fracture carpal scaphoid bone by bone graft with external splintage without any surgical fixation .

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